PUBLIC HEALTH ASSESSMENT

WHEELING DISPOSAL SERVICE COMPANY LANDFILL
AMAZONIA, ANDREW COUNTY, MISSOURI
EPA FACILITY ID: MOD000830554

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Prepared by:

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Section for Environmental Public Health
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SUMMARY

The Wheeling Disposal Service Company, Inc., (Wheeling Disposal) site is a closed municipal and industrial waste landfill, approximately 1 mile southeast of Amazonia, Andrew County, Missouri. On-site shallow groundwater is contaminated with Volatile Organic Compounds (VOCs) (methylene chloride, carbon tetrachloride, trichloroethylene) and metals; however, no one is using that water for potable purposes at present. Isolated farm houses are situated in the vicinity of the site, but the houses that would most likely be affected are connected to the public water system. The site was placed on the National Priorities List in October, 1989.

From the information reviewed, DOH concludes that the Wheeling Disposal site currently poses no apparent public health hazard. No exposures are known to be occurring at this time. Potential exposure pathways have been identified, but remedial actions eliminated them. Past exposures occurred through use of contaminated well and spring water. The contaminants have not been conclusively linked to the site. Exposure to some of those contaminants were at levels of public health concern. Past exposures through the release of contaminants into the air occurred periodically when the site was in operation. Little information is available to evaluate the contaminants and levels of those exposures. Former landfill employees were exposed to site contaminants, but those exposures are not believed to have been at levels of public health concern.

The community is concerned about the safety of their drinking water. Community members are also concerned about cancer incidence in the area, about impact on local livestock and wildlife, and about long-term health effects resulting from air emissions that occurred in the 1970s (due to reported nauseating odors coming from the site at that time). There have been concerns in the past about lack of response by all agencies to the communities concerns.

A Record of Decision (ROD) was signed in 1990. Following the completion of a Remedial Design (RD) remedial activities were completed in July, 1994. They included installation of a vinyl cover over most of the landfill cells; reestablishment of vegetative cover; and the installation of a four strand wire fence with a locked gate and warning signs around the landfill cells. These remedial actions should prevent future exposure to contaminants through air and soil pathways. Long-term groundwater monitoring and other follow-up measures that have been implemented should ensure that the remediation was effective in protecting public health and the environment.

Exposure to site contaminants occurred in the past, but those exposures either could not be evaluated, because of lack of information, or were at levels below public health concern. Exposures to contaminated well water occurred, but are not believed to be site related. Some of those exposures were at levels of public health concern. Information gathered in a door-to-door health survey conducted by DOH indicates that the community has reported no adverse health effects that can be associated with exposures to contaminated groundwater.

To ensure the protection of public health, ATSDR and DOH developed a public health action plan. An outline of that plan follows:

1. DOH will continue to annually monitor available private wells around the site as part of their legislatively mandated responsibilities for monitoring waste sites throughout the state. The wells

selected for monitoring will be those identified as most likely to become contaminated and those used for human water supplies. Monitoring will continue until the source is completely removed or remediated.

2. DOH and ATSDR will review new sampling data as they become available.

3. DOH will continue to respond to reports and concerns expressed by the community, or will refer the concerned person to the agency that can address those concerns.

STATEMENT OF ISSUES

The Missouri Department of Health (DOH) has written this public health assessment to address past, current, and future possible exposure to environmental contamination for nearby residents at the Wheeling Disposal Site.

BACKGROUND

Site Description and History

The Wheeling Disposal site, a former municipal and industrial landfill, is in a rural setting in northwestern Missouri. It is approximately 6 miles north of St. Joseph, Missouri and 1 mile southeast of Amazonia, Missouri. The original site consisted of two adjacent parcels of land, totaling approximately 200 acres, in Section 6 of Township 58N, Range 35W of Andrew County, Missouri. In late 1991, the site's owner purchased additional property on the south and on the northwest of the site (See Figure 1)(1).

The site was proposed for the National Priorities List (NPL) in 1987 and was added to the list in October, 1989. The reason for the site's NPL listing was the confirmed contaminated on-site groundwater and the possibility of the site contaminating on- and off-site surface water. If contamination were to migrate off-site, it could pose a threat of human exposure through consumption of contaminated private well water or contact with contaminated surface water.

Two private properties abut the western edge of the site near Highway K. They are approximately 800 feet from the Wheeling Disposal property line, but approximately 1,500 feet from the nearest waste disposal area. The remaining area surrounding the site consists of isolated farmhouses. The closest of those farmhouses is approximately 0.5 miles east-southeast of the site.

The Wheeling Disposal Service Company, Inc., began operating in the St. Joseph area in 1964. Municipal waste was deposited in the site's southern ravine at a maximum depth of 20 feet. The company opened the industrial waste disposal facilities during the early 1970s. In 1975, the Missouri Department of Natural Resources (MDNR) issued a permit limiting industrial waste disposal to a 10 acre area in the central portion of the site (Figure 2). Prior to 1975, a permit was not necessary. The permit specified disposal methods and required written records of the quantity, type, source, and location of disposed wastes. Disposal logs, required by MDNR during that period, indicate that the facility accepted the following kinds of waste: leather tanning sludges, pesticides, asbestos, laboratory wastes, building debris, paint sludges, battery wastes (alkaline flashlight batteries), cyanide waste, neutralized pickle liquor, and miscellaneous crushed drums (2-3).

The firm accepted permitted industrial waste for disposal until 1986, when closure of the industrial landfill began. Closure was confirmed in May 1987, when a site visit by Environmental Protection Agency (EPA) representatives validated that the site had been covered with soil, graded, and no longer received wastes for

disposal. During the period of permitted operation (1975-1986), MDNR inspected the site periodically. Inspection reports cited a number of violations including failure to cover waste with compacted earth, disposal of hazardous materials outside of permitted areas, and improper construction of solid waste trenches (2).

While the site was in operation, 2 full-time employees (including the owner), worked at the landfill. Over time, others were employed for various lengths of time. A maximum of five people are believed to have worked at the site at any given time.

A Record of Decision (ROD) for this site was signed on September 27, 1990. The ROD described the selected remedial actions, which were determined after completion of studies and release of the proposed plan for public comment. A consent decree was also signed that legally required the potentially responsible parties (PRPs) to complete the remedial work listed in the remedy. Remedial actions completed include: disposal of drums on site, closing selected monitoring and existing water wells, covering contaminated areas with a geoliner, adding additional soil cover and re-vegetation, installing new monitoring wells, venting gases, fencing and posting warning signs around the disposal area, implementing deed restrictions, monitoring groundwater over time, and maintaining site integrity (4). Completed remedial actions have eliminated possible human exposures and are protective of public health.

On-Site Contamination

Groundwater
Groundwater on site was first sampled from three wells in 1976. Three additional wells were added and sampled in 1979. Most of the sampling and analyses conducted from 1976 through 1981 were performed by MDNR and focused on metals. The maximum levels of contaminants of concern from the early sampling were arsenic (100 ppb), iron (136,000 ppb), manganese (6,440 ppb), and barium (3,900 ppb) (1,2).

Sampling of six on-site monitoring wells in 1983 and 1987 indicated limited groundwater contamination. To better characterize site contamination, a Remedial Investigation (RI) was conducted in 1989. As part of the RI, 15 additional monitoring wells were installed on site. Twelve of those wells were paired (1 deep, 1 shallow), allowing shallow and deep groundwater to be monitored in the same location. Those 15 new wells and the existing six monitoring wells were sampled during the RI. Table 1 lists the contaminants of concern identified from the 1983, 1987, and 1989 sampling rounds. The levels presented include the minimum and maximum contaminant concentrations detected during each sampling round (1,2).

In the 1989 sampling, volatile organic compound (VOC) contamination was evident in shallow groundwater. VOC contaminants of concern include methylene chloride, carbon tetrachloride, and trichloroethylene (TCE) (Table 1). Contamination of deeper groundwater was not well defined. Sampling results for the deeper groundwater were not consistent. One well had detectable levels of carbon tetrachloride and chloroform while another well contained TCE. The deeper wells were resampled on three sequential dates and none of those chemicals were detected (1,2).

Surface Water
Surface water samples were collected at groundwater seep areas in the northern drainage channel, at on-site downstream locations, and from an off-site intersecting stream, which served as a background location. Two seep samples were taken each year in 1983, 1987, and 1989. Elevated levels (above EPA's Maximum Contaminant Levels (MCLs) for public drinking water) of VOCs, Atrazine (a pesticide), aluminum, iron, and magnesium were detected in seep samples. VOCs included 1,2-dichloroethane, TCE, and carbon tetrachloride. An MCL is the maximum permissible level of a contaminant in water that is delivered to the free-flowing outlet of the ultimate user of a public water system. While MCLs are regulatory concentrations, and apply only to public water systems, their values are used as guidelines for private drinking water wells. The maximum level of contaminants of concern detected in the seeps appear in Table 2 in the appendix.

Six split samples were taken from on-site down stream locations during three sampling events in 1989 and

1990. Split samples are divided and sent to different laboratories for verification of the accuracy of analysis. The sampling results for the pooled and flowing on-site water samples did not indicate the presence of VOCs or pesticides. Also, samples collected from the intersecting stream did not contain VOCs or pesticides. Metals that were detected were similar to the background levels and not at levels of concern.

Soils
Soil samples were collected at 0 to 12-inch depths, at 18 inches, and at 36 inches from February to March 1989. Eight samples (including one duplicate) were collected from the 0 to 12-inch depth. No samples were collected for surface soil (top 3 inches) only. Twelve samples (including duplicate, blank, and background samples) were collected at the 18- and 36-inch depths.

Total chromium was found in the 0 to 12-inch samples at a maximum of 1,490 parts per million (ppm), which is above the average background levels (60 - 90 ppm) and the comparison value for hexavalent chromium(1) (300 ppm - Reference Dose Media Evaluation Guide (RMEG) for a child). An RMEG is a media-specific comparison value used to evaluate exposures at hazardous waste sites. The EPA split for this sample indicated a level of 2,000 ppm chromium. Resampling (January 1990) confirmed various levels of chromium were present near disposal areas (1,2).

Pesticides were also detected in a number of samples. Dieldrin and disulfoton were found at levels above their comparison value in the 0 to 12-inch samples. Re-sampling for pesticides was conducted in January 1990. At that time, two samples were collected from the disposal area where the highest levels of pesticides were originally found. Disulfoton was not detected in the samples, and no analyses were performed for dieldrin.

Sediment
A total of 13 sediment samples were collected in March 1989 from ravines and drainage pathways at 0 to 6-inch depths (1,2). Aldrin (detected at 8,600 ppb) and dieldrin (detected at 470 ppb) were present in a sample collected from the southern ravine. Subsequent sampling has not confirmed the presence of aldrin at the high levels originally found. Dieldrin levels were not provided for the later sampling rounds conducted in September 1989 and January 1990. Because measured levels were below a level expected to cause health effects, aldrin and dieldrin were eliminated as contaminants of concern.

Air
No data are available to indicate the levels of volatile compounds that are released to the air. No information is available on migration of methane gas, a common decomposition product of landfill materials.

Off-Site Contamination

Groundwater
Six private wells in the area were sampled in 1983, 1987, and 1989 (see table below). In 1983, three wells contained contaminants that have not been conclusively connected with the site (wells 1-3). A private well west of the site (well 4) that was tested in 1989 contained toluene at 1,600 ppb, which is above the comparison value (cv) of 1,000 ppb; iron at 3,350 ppb, which exceeds the cv of 300 ppb; and lead at 69 ppb, which is above the cv of 0. Well 4 had been tested in 1987 and no contaminant had been detected. A comparison value is a chemical specific number below which non-cancer health effects are unlikely to occur. When a cv is exceeded, it does not necessarily mean that health effects will occur, it only means that the chemical should be evaluated further.

In 1983, another well (well 5) contained iron at 895 ppb and manganese at 353 ppb, which is greater than the cv of 50 ppb, but no contaminants of concern were detected in 1987. One other private well sampled in 1983 (well 6)contained chloroform at 143 ppb, which exceeds the comparison value of 100 ppb, but no chloroform was found in 1987.

Surface Water

Seep water was collected west of the site in 1983. Iron was present in the water at 48,400 ppb, and manganese was present at 2,400 ppb. No further sampling was conducted at that location to provide information on current conditions.

Air
Neighbors reported that nauseating odors came from the landfill while it was in operation. No data are available to determine the composition of the emissions or the concentrations of contaminants. It is reported that tanning wastes were dumped at the site during its operation. As they decompose, tanning wastes emit hydrogen sulfide, which causes a strong, nauseating odor. However, the known presence of tanning wastes only makes it possible that hydrogen sulfide was the cause of the bad odor reported by nearby residents. No testing has ever been conducted to confirm the presence of hydrogen sulfide at the site. A data gap also exits in what other chemicals might have been present that would have contributed to the odors noticed off site.

Site Visits
A site visit was conducted on June 7, 1990, by DOH and ATSDR representatives, the EPA site remedial project manager (RPM), a PRP representative, and the owner of the facility. The site's owner conducted a two-hour walking tour of the site. The owner pointed out the location of the different trenches, ponds, blend areas (areas where liquid wastes that did not lend themselves to evaporation were mechanically mixed with soil), seeps, and monitoring wells.

The owner pointed out on-site monitoring wells. Old wells were constructed with PVC pipe and had slip-on covers (one was found without the cover); the newer monitoring wells were protected from unauthorized access with locking, protective covers. Some of the early wells are reportedly now dry.

During the visit, the team noticed three rubble piles from the demolition of farm buildings. Two piles are believed to be old homesteads, and the other is believed to be an old farm building. From one of the former homesteads (known as the east house), the nearest existing residence can be seen across a ravine, approximately one-half mile from the eastern site boundary.

The team noted obvious areas of ground settling in the municipal landfill area. There was no standing water in those depressions; suggesting that water is infiltrating the ground through the landfill waste material.

In November 1991, DOH personnel visited areas around the site to determine if changes had taken place. At the site entrance road, a small sign was posted and read, "No Trespassing, Private Property, Keep Out." No tracks were visible in the snow to indicate that anyone had entered the site. A telephone conversation with the RPM revealed that no changes had been made to the site since the June 1990 site visit. On January 5, 1994, DOH confirmed that site conditions had not changed since 1991.

A June 21, 1994, visit to the site by DOH representatives confirmed that remediation had begun and was well underway. DOH personnel, along with the Andrew County sanitarian, were given an in-depth tour of the site and remedial activities by EPA's site RPM. At that time, contractors had already begun installing the cap over hazardous waste areas. (See Figure 3 for depiction of contaminated areas to be capped). DOH noted that work was progressing and remediation should be completed on schedule.

Section for Environmental Public Health (SEPH) personnel conduct annual site visits to monitor private wells around the Wheeling Disposal site. Four off-site private wells are monitored annually for pesticides, Volatile Organic Chemicals (VOCs), and Heavy Metals. Samples collected in March 1999 were not above any regulatory limits for public drinking water. To date, none of these samples have shown analyte concentrations above any regulatory limit for public drinking water.

Demographics, Land Use, and Natural Resource Use

Demographics
The Wheeling Disposal site lies approximately one mile southeast of Amazonia, Missouri. The town's

population was 257 people, as listed in the 1990 census, compared to 314 people in 1980. The census reported that 100% of the population is white. In 1989, 12% of the population lived below the poverty level. People that are five years of age or younger comprise 7.8% of the population, and 14% of the people are at least 65 years old. The Amazonia Elementary School, which had a 1991-1992 enrollment of 120 students in grades kindergarten through sixth, is within the city limits but is not impacted by the site. There are no other schools or hospitals near the site or affected by it.

Land Use
Land in the area around the site is used for crops, pastures, and woodlands. The Missouri River floodplain, which is less than a mile west of the site, is used mostly for farming. The 40 acres adjacent to the southeast area of the main property (Figure 1) reportedly were never used as a landfill. That area is now used as pasture during two months of the year. Current Andrew County Assessor landowner records indicate that Wheeling Disposal has purchased additional property along their south border and west of the northwest portion of the site. That area is currently undeveloped.

Natural Resource Use
The site is on an upland ridge that is a topographic divide. Surface runoff flows both to the north and to the south to unnamed intermittent streams. Northern surface runoff later flows into Mace Creek, while the southern portion flows into Dillon Creek. The creeks finally flow together southwest of the site, eventually discharging into the Missouri River about 3 miles south of the site (2). Groundwater flow from the site is generally westward.

The site consists of rolling hills. The industrial waste disposal area is mainly on the ridge top, which runs east to west. The site is drained by deep ravines on the north and south. Wheat was growing in the open fields along the ridge top at the latest site visit. The rest of the area was forested or in pasture. In one field there was wheat that appeared to be healthy and green, except for a few small areas where the plants or lower stems were turning brown. The site visit team saw numerous deer and other animal tracks, which indicate that wildlife occupies or passes through the site.

Currently, there are no residences on the site. Most nearby residents, including those closest to the site, now use a public water supply for their drinking water. In the past, those people used private wells. At least one home continues to use a private well, and area livestock may be watered using private wells.

Hunting occurs in the area and, perhaps, on-site. Deer are prevalent in the area, and deer tracks were seen on the site. On-site surface water and the intermittent streams near the site are not used for fishing or recreation. The Missouri River is the closest surface water used for fishing and other forms of recreation. This site is not expected to affect the Missouri River.

DISCUSSION

To determine whether nearby residents are exposed to contaminants migrating from the site, DOH and ATSDR evaluate the environmental and human components that lead to human exposure. Exposure pathways consist of five elements: a source of contamination, transport of contaminants through an environmental medium, a point of exposure, a route of human exposure, and an exposed population. DOH and ATSDR identify exposure pathways as completed, potential, or eliminated. In completed exposure pathways, all five elements exist and indicate that exposure to a contaminant has occurred, is occurring, or will occur in the future. In potential exposure pathways, at least one of the five elements is missing, but that element still is possible. Potential exposure pathways indicate that exposure to a contaminant could have occurred, could be occurring now, or could occur in the future. In eliminated exposure pathways, at least one of the five elements is missing and will never be present.

Completed Exposure Pathways

Groundwater
Contaminants were detected in private wells west of the site in 1983, 1987, and 1989. The levels and types of the contaminants varied among wells and sampling rounds, and the contamination has not been conclusively connected with the site. The people who used the contaminated well water, an estimated six to ten people or three families, were exposed to contaminants through ingestion, inhalation of volatile compounds, and direct skin contact. Residences in the area were connected to the public water supply in 1989. A few private wells are still used in the surrounding area, but subsequent testing has not found them to be contaminated.

Soil
Shallow and deep soils are contaminated because of wastes that were disposed of in trenches at the site. People who worked on the site digging the trenches and burying the wastes were exposed to contaminants through incidental ingestion of contaminated soils and through direct skin contact with the contaminants in the soil. Exposures stopped when the landfill closed.

Air
While the site was operating, nearby residents complained to state and federal environmental and health agencies of nauseating odors originating from the landfill. No data are available to indicate the types of contaminants and the levels of contaminants that may have been emitted. The reports of foul odor emissions stopped when the site was closed. Nearby residents, estimated to be two families with about five people in each, and former on-site landfill workers were exposed to the contaminants through inhalation. The on-site workers were also exposed to contaminants through ingestion of airborne particulates. The facility employed two full-time workers and may have had as many as five workers present at any one time. Nearby residents were less likely to ingest airborne particulates because of dispersion of the particles and filtering of the material through vegetation.

A farm equipment operator's exposure to contaminated soils and dust is possible during cultivation of crops planted on site. During a site visit (June 1994), DOH representatives noted that wheat was again being grown on the site. Of course, this would have required disturbing the site's topsoil during cultivation and planting. The wheat will require harvesting in the fall. These activities could expose the farmer to contaminated dust and soil.

Crops
Site visits have documented agricultural crops being grown on-site. During several site visits wheat has been grown on site, but other crops could also be grown on-site. Exposure to contaminants could occur through contaminated food crops. Studies have been conducted indicating that many grains and vegetables can uptake chromium and chloroform into vegetative matter. Some data indicates that chromium has a low mobility for translocation from roots to above ground parts of plants (5). Chloroform, is also not taken up in great quantities by leaf and seed material (6). Therefore, it is highly unlikely that the harvested portion of the vegetation at this site would contain levels of chromium or chloroform that would be of health concern.

Potential Exposure Pathways

Groundwater
Shallow groundwater is contaminated on the site. The quality of deeper groundwater has not been conclusively established. Private wells west of the site were contaminated, but the contamination was not definitely linked to the site. Some, but not all, of the contaminants detected in the private wells were also detected in on-site groundwater. Contaminants at the site can migrate westward, the direction of shallow groundwater flow, to drinking water wells in the area. Although most people in the area use a public water supply, a few private wells are still being used by local residents. If the contamination reaches drinking water wells, the people using the water would be exposed to contaminants through ingestion, inhalation of volatile compounds, and direct skin contact.

Surface Water

Contaminated groundwater seeps to the surface in areas of the northern ravine and west of the site. Contamination levels are high in the seep water at the northern ravine. To date, the contamination does not appear to be entering the intermittent streams north of the site. No information is available indicating anyone has ever come into contact with the contaminated water at the seeps. Former landfill employees and trespassers are most likely to have come into contact with the water. Possible routes of exposure would have been skin contact and inhalation of volatile compounds. Incidental ingestion is also a possible, but less likely, route of exposure.

Should contaminants migrate to the intermittent stream, people who farm, hunt, or care for livestock in those areas could come into contact with the contaminants. Exposure routes could include skin contact, inhalation of volatile compounds, and incidental ingestion.

Soil
Chromium is present in soils on the site. The form of the chromium is not known. The less toxic trivalent chromium is usually the most abundant form found in the environment. The assumption is made, for purposes of this public health assessment, that most of the chromium present is in the more toxic hexavalent form. No surface soil samples have been analyzed to provide information on what type and how much chromium people on the site may contact. As discussed earlier, former employees who operated heavy equipment at the landfill were assumed to have come into contact with contaminants in the soil. Trespassers may also come into contact with the contaminants. In addition, remedial workers who are not protected could also contact soil contaminants. Trespassers and unprotected workers would be exposed to the soil contaminants through incidental ingestion, inhalation of airborne particulates, and direct skin contact.

Air
VOCs have been detected in shallow groundwater and seep samples. The VOCs are released into the air when groundwater seeps into the ravines or migrates upward through soil into the air. No data are available to indicate the levels of VOCs released to the air. The highest levels would be expected to be at the seeps. On-site workers and trespassers may inhale the VOCs when they are on site, especially near seeps.

Toxicological Evaluation

Introduction
This section discusses the health effects of exposure to specific contaminants. To evaluate health effects, ATSDR has developed a Minimal Risk Level (MRL) for contaminants commonly found at hazardous waste sites. The MRL is an estimate of daily human exposure to a contaminant below which non-cancer, adverse health effects are unlikely to occur. MRLs are developed for each route of exposure, such as ingestion and inhalation, and for the length of exposure, such as acute (less than 14 days), intermediate (15 to 364 days), and chronic (greater than 365 days).

Chromium
Former landfill employees are assumed to have been exposed to contaminants in the soil while working. Chromium was the only contaminant identified above comparison values in soils. Exposure was through incidental ingestion of contaminated soil, inhalation of airborne particulates, and direct skin contact. Currently, on-site soils are infrequently plowed, and wheat is planted. Exposure to chromium may occur on site during infrequent agricultural cultivation of soils over the disposal trenches or trespassing on the site.

Limited soil samples taken from these areas have shown varying levels of total chromium to a maximum of 2,000 ppm. No surface soil (top 3 inches) data are available. Also, only total chromium was analyzed. In the environment, most chromium exists as trivalent chromium (chromium III). Chromium VI may exist in the environment at greater levels than chromium III if chromium VI has been released to the environment. However, under most circumstances, chromium VI will convert to chromium III (5). Only tests for total chromium (both forms combined) were conducted at the site. Although chromium III is likely to be more prevalent at the site, for purposes of public health evaluation, DOH will assume that most of the chromium in soil is the more toxic chromium VI form. EPA has developed Reference Doses (RfDs) for ingestion of

chromium III and chromium VI (5). An RfD is an estimate of a daily exposure to the general public (including sensitive subgroups) that is likely to be without an appreciable risk of non-cancer health effects during a lifetime of exposure. If an employee had ingested the levels of chromium found in on-site soil for 23 years, 5 days a week, 50 weeks a year, that person would not be expected to develop any non-cancer, adverse health effects. People who may be exposed to those levels when they occasionally cultivate the soil for crops also would not be expected to develop any non-cancer, adverse health effects.

EPA has classified chromium VI as a known human carcinogen. A correlation between chromium VI exposure and lung cancer has been found (5). However, no cancer slope factor has been derived to help estimate if people exposed to the levels of chromium on-site would increase their risk of developing cancer. Considering the duration of exposure and the likelihood that not all of the chromium on the site is chromium VI, little or no increased risk is likely to result from exposure.

Chloroform

People were exposed for a short period of time to chloroform through use of their private well. The chloroform is not believed to be site-related, because subsequent sampling did not identify the presence of chloroform. Chloroform is commonly found in private wells following treatment of the water for bacteria (6). Chloroform is present in on-site groundwater.

Chloroform was found in a private well at 143 ppb. The duration that people were exposed to that concentration is unknown, but a sample analyzed 4 years later did not contain chloroform. ATSDR has developed MRLs for acute, intermediate, and chronic exposure to chloroform (13). One hundred forty-three ppb exceeds the chronic MRL for an adult and the intermediate MRL for a child. Because the duration of exposure is unknown, possible non-cancer, adverse health effects are difficult to evaluate.

Chloroform is present in on-site groundwater at a maximum of 128 ppb. If that level reaches private wells, people using the water would be exposed to levels that exceed the chronic MRL for adults and approach the intermediate MRL for children.

People exposed to chloroform through ingestion, inhalation, or skin contact can experience effects to the central nervous system, liver, and kidney. Short-term exposure to high concentrations in air causes tiredness, dizziness, and headache. Long-term exposure to chloroform in air, food, and drinking water alters liver and kidney function (6).

Liver and kidney cancer have been reported in experimental animals. EPA classifies chloroform as a probable human carcinogen. EPA has developed a cancer slope factor for chloroform (6). If people were to consume the amount of chloroform detected on site over a long period of time, they would have a moderate increased risk of developing cancer. The people who consumed chloroform found in their private well likely did not consume enough over the known period of time to significantly increase their risk of developing cancer.

Children and Other Sensitive Populations

A sensitive population will exhibit a different or enhanced response to hazardous chemicals than will most persons exposed to the same level of hazardous chemicals in the environment. Reasons may include genetic makeup, age, health and nutritional status, and exposures to other toxic substances. In general the elderly, with declining organ function, and the young with immature and developing organs, will be more vulnerable to toxic substances than healthy adults.

None of the exposures at this site are expected to adversely affect the health of children who may have been exposed in the past. No known exposures are occurring presently; no exposures are expected for children in the future.

Health Outcome Data

In 1986, DOH surveyed nearby residents for information on any unusual disease histories or rates. The survey included information on the drinking water source for the residents. The survey found that two definable sub-populations live in the area: an older, more stable group with an average residency period of approximately 30 years; and a younger, more transient group with an average residency of about three years. Other than some individuals reporting odors associated with the site, neither group had any site-related complaints.

DOH evaluated birth outcomes and cancer deaths for this public health assessment. Data were evaluated for zip codes 64421 (Amazonia) and the Andrew County portion of zip code 64505 (St Joseph). This was the lowest level at which data could be obtained for evaluation. The area studied includes a much larger number of people than may actually be impacted by the site. Therefore, the results of the evaluations may not clearly indicate actual conditions at the site.

Fetal deaths, birth defects, and low birth weights recorded for the study are were compared to state rates. No statistically significant difference was seen between the sturdy area rates and state rates.

Total cancer death rates for the study area were not statistically different than state rates. However, when cancer types were analyzed, the rate of non-Hodgkin's lymphoma was higher for women over 65 years of age who live in the study area. This finding is based on a very low number of cases. Two deaths were observed where one was expected (an *expected* death is a statistical term measuring mortality in a specified population). Conclusions cannot be made from this finding, because the fact that two deaths caused by this disease occurred in the zip code areas studied could be coincidence. Also, the two women may not have lived in the area impacted by the site. Some studies have shown an association between exposure to herbicides (and other farm chemicals) and non-Hodgkin's lymphoma (Sittig, 1985). No exposure to those types of chemicals are known to have occurred as a result of contamination at the site.

COMMUNITY HEALTH CONCERNS

The following community concerns were expressed during an investigation conducted by an EPA contractor in 1988 and during a public meeting held by EPA in 1990. The investigation consisted of community interviews concerning the Wheeling Disposal site (8). The public meeting allowed residents in attendance to ask questions or to comment on the site. After the public meeting, ATSDR and DOH representatives were available to talk one-to-one with community members who had health and exposure questions or comments. Based on those interviews and the comments from the public meeting, the following statements summarize the community concerns:

1. My water supply was sampled by either EPA, MDNR, or DOH, but I don't understand the results I was given. Is my water safe to drink or not?

From available water testing results, it does not appear that off-site wells have been contaminated by the site. The water should be safe to drink if no dangerous bacteria or non-site-related contamination was found. When the results of the analyses were sent to you, a telephone number should have been included. You should not hesitate to call and ask for clarification of the information. The agencies involved in providing you with information will be given a copy of this public health assessment. Your concern will inform the agencies that more information should be provided to you when well water test results are provided.

2. Is the site affecting the health of local residents?

Past exposures to contaminants found in private well water has not been conclusively shown to be site-related. In fact, the contaminants found probably did not come from the site. The possible health impact that may result from exposures to contaminants in the well water are discussed in the *Toxicological Evaluation* section of this document. Past exposures through inhalation of contaminants released into the air cannot be

evaluated, because little information on the types and levels of contaminants is available. No current exposures to site contaminants are known. Therefore, the site is not believed to be affecting the health of area residents at this time.

3. Could the site be affecting the health of animals or of wildlife that wander over the property?

For the most part, the contaminants found on the site are not expected to accumulate in plants that may be consumed by animals, wild or domestic. Animals that stray onto the site could possibly drink contaminated water seeping to the surface. The likelihood of an animal drinking enough of the seep water to harm it is remote. Therefore, the site contamination is not believed to be presently impacting animals at or near the site, and careful monitoring will prevent any future impact on the animals.

4. Could the site be causing adverse health effects in livestock on adjoining farms?

This question is addressed in the previous response. Furthermore, there is no evidence that migration of chemicals off-site would be at levels of health concern for humans or animals.

5. Is there a high incidence of cancer in the area?

The cancer risks associated with exposures that have occurred in the past are discussed in the *Toxicological Evaluation* section of this document. **Where is the hod section?** Evaluation of the available health outcome data, which includes the survey of nearby residents, does not indicate that an increased rate of cancer (all types) deaths exists in the area. However, the data for a specific cancer, non-Hodgkin's lymphoma, indicate a higher-than-expected rate for women aged 65 and over in the study area, which is much larger than the area that may be impacted by the site. That increased rate is likely to be a coincidence. No information is available indicating that people have been exposed to site contaminants associated with non-Hodgkins lymphoma.

6. Will there be long-term health effects from exposure to the nauseating odor experienced by residents near the landfill in the mid-1970s?

Because no data are available on the make-up of the contaminants or their levels that caused the odor, evaluation of those exposures is impossible. However, no unusual health effects were reported in the neighborhood survey that was conducted by DOH. Therefore, there is no information that would lead DOH to believe that long-term effects have occurred or will occur.

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1. In nature, chromium commonly appears in both trivalent and hexavalent forms. Hexavalent chromium is more toxic to living systems. Usually, trivalent chromium is expected to be the most prevalent form found in surface soils; however, because the distinction was not made during sample analyses, DOH assumes all the chromium present was hexavalent.

PUBLIC HEALTH ASSESSMENT

WHEELING DISPOSAL SERVICE COMPANY LANDFILL
AMAZONIA, ANDREW COUNTY, MISSOURI

CONCLUSIONS

From the information reviewed, DOH and ATSDR conclude that the Wheeling Disposal site currently poses no apparent public health hazard. No exposures are known to be occurring at this time; although, there is potential for exposures to occur in the future.

1. Shallow groundwater has been confirmed to be contaminated on site. Contamination of the deeper groundwater has not been confirmed.

2. Pesticides have been found in the on-site ravine sediments.

3. Site access is restricted and warning signs are posted, limiting access to on-site contaminants.

4. On-site contaminants are covered with a geoliner, soil cover and vegetation, limiting exposures.

RECOMMENDATIONS

1. Monitor off-site and on-site shallow and deep groundwater to determine if contaminants are migrating from the site into groundwater.

2. Monitor surface water and seeps, including the intermittent streams to determine if contaminants are migrating into surface water.

3. Monitor vegetation, soil cover and geoliner in waste areas to assure that vegetative cover remains intact.

PUBLIC HEALTH ACTION PLAN

The Public Health Action Plan (PHAP) for the Wheeling Disposal Service Company, Inc., site contains a description of actions to be taken by ATSDR and/or DOH at and in the vicinity of the site subsequent to the completion of this public health assessment. The purpose of the PHAP is to ensure that this public health assessment not only identifies public health hazards, but provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. The public health actions that have been or will be implemented are as follows:

1. DOH will continue to monitor available private wells around the site as part of their legislatively-

mandated responsibilities in monitoring waste sites throughout the state. The wells selected for monitoring will be those identified as most likely to become contaminated and those used for human water supplies.

2. DOH/ATSDR will review new sampling data as they become available.

3. DOH will continue to respond to reports and concerns expressed by the community or will refer the concerned person to the agency who can address the concerns.

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CERTIFICATION

This Wheeling Disposal Service Company, Inc., Public Health Assessment has been prepared by the Missouri Department of Health, Section for Environmental Health, under cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the public health assessment was initiated.

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The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health assessment, and concurs with its findings.

Richard Gillig
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3. Agency for Toxic Substances and Disease Registry (ATSDR). September 1988. Preliminary Health Assessment, Wheeling Disposal Service. Atlanta, Georgia.

4. Burns & McDonnell Waste Consultants Inc. September 1993. Design Document (Final Design) for Wheeling Disposal Site, Amazonia, Missouri. Burns & McDonnell Waste Consultants Inc., Overland Park, Kansas.

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8. ICF Technology, Inc., May 1988. Community Relation Plan for Wheeling Disposal Site, ICF Technology, Inc., EPA Contract No. 68-01-7251.

APPENDIX

Figure 1. Wheeling Disposal Site Location Map.

Figure 2. Wheeling Disposal Site Topography and Features Map.

Figure 3. Wheeling Disposal Remedial Area

TABLES

Table 1. CONTAMINANT CONCENTRATION RANGE IN ON-SITE GROUNDWATER MONITORING WELLS
Wheeling Disposal Service Company, Inc Site Sampling in 1983, 1987, 1989 All Levels in ppb(1,2)

Contaminant	1989	1987	1983	Comparison Value Level(ppb)/Source
Methylene Chloride*	ND - 1,000	NR	NR	5 MCL
Bis(2-Ethylhexyl)Phthalate*	NR	ND - 170	ND	3 CREG
Chloroform*	ND - 128	ND	ND	100 MCL
Carbon Tetrachloride*	ND - 3,100	ND - 67	NR	5 MCL
1,2-Dichloroethane*	ND - 106	ND	ND	5 MCL
Trichloroethylene (TCE)*	ND - 1,200	ND - 650	ND - 1,200	5 MCL
Arsenic*	2 - 418	ND	ND - 37	50 MCL
Aluminum	<200 - 580,000	ND - 3,700	263 - 8,190	50 MCL
Barium	<10 - 7,100	58 - 1,200	ND - 1,893	2000 MCL
Iron	<14 - 557,000	ND - 13,000	445 - 26,300	300 SMCL
Lead*	<2 - 203	ND	ND - 69	- --------
Manganese	<3 - 8,773	24 - 6,600	24 - 3,700	50 RMEG
Sodium	3,280 - 460,000	10,000 - 390,000	NA	-- -------

-- = Not Available
MCL= Maximum Contaminant Level
SMCL = Secondary Maximum Contaminant Level
NR = Not Reported
< = Less Than
ND=Non-Detect
CREG = Cancer Risk Evaluation Guide
RMEG = Reference Dose Media Evaluation Guide
* The National Toxicology Program, the International Agency for Research on Cancer, and/or the U.S. Environmental Protection Agency have/has evaluated this chemical and determined that there is evidence that it is carcinogenic in humans or animals.

Wheeling Disposal Site Location Map

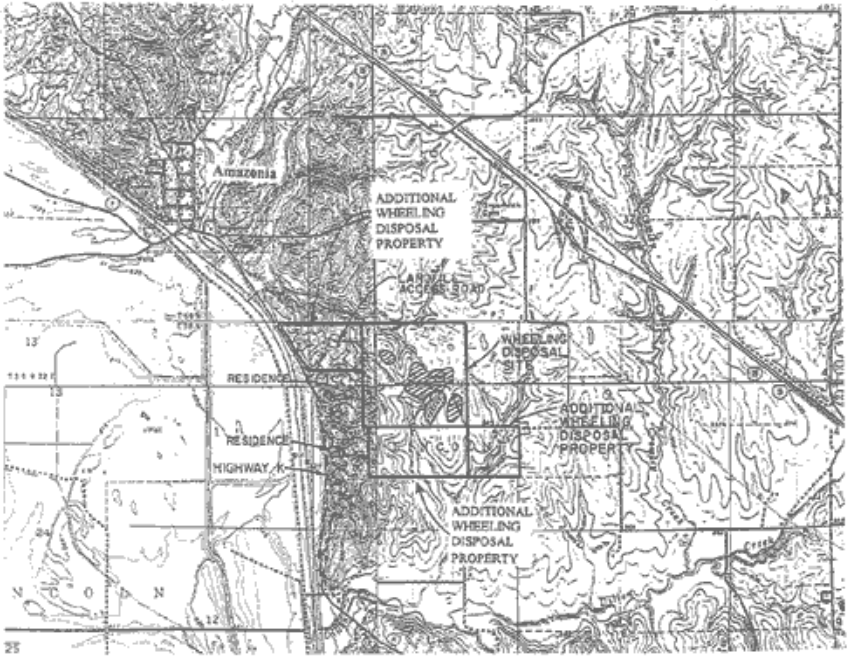


FIGURE 1

WASTE FACILITIES (Approx. Location)

INDUSTRIAL

MUNICIPAL/SANITARY

Location

N

2000 0 2000 4000

scale feet

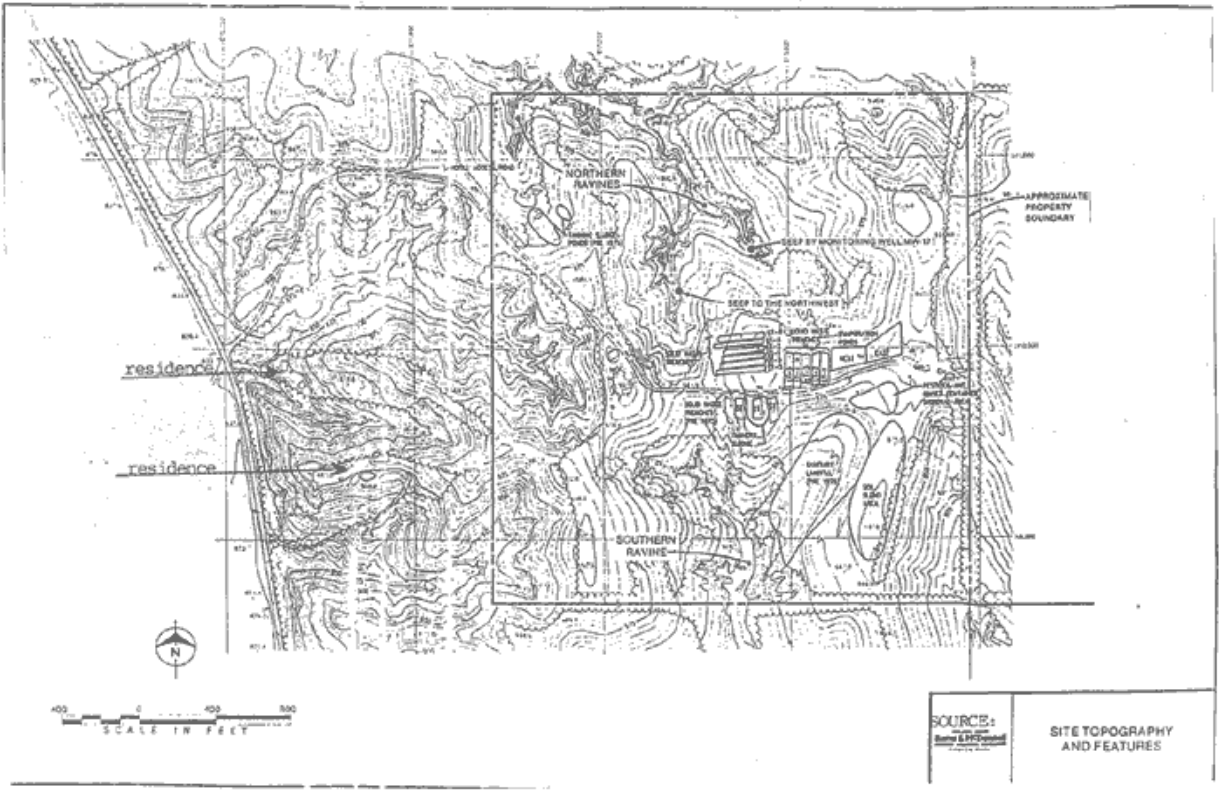
LEGEND

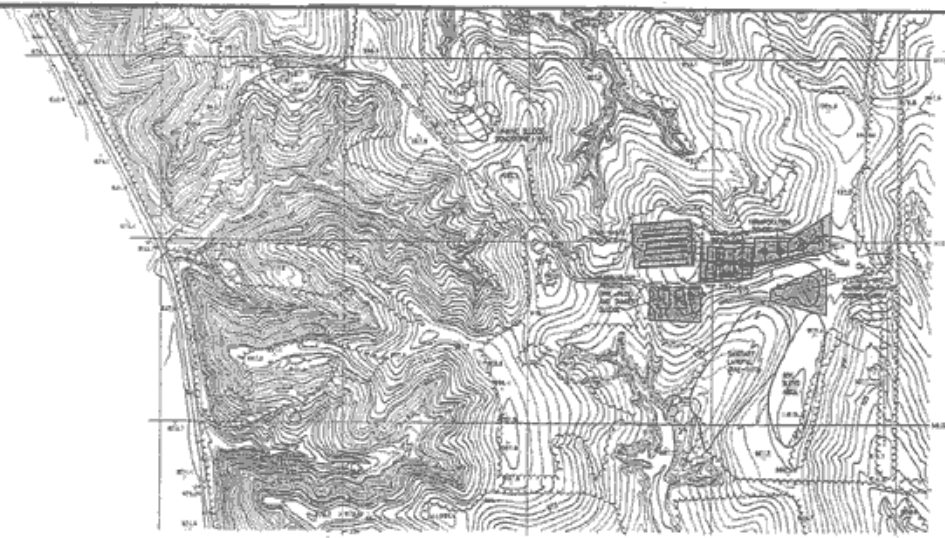
□ RESIDENCES

SOURCE:

REMEDIAL DESIGN
WORK PLAN FEB. 1993

FIGURE 2 Wheeling Disposal Site Topography and Features Map





Legend:

Shaded areas to receive protective cap, fence to limit access, and maintenance.

SOURCE:

NORTH

SCALE IN FEET

FIGURE 3

Wheeling Disposal Remedial Area

REMEDIAL DESIGN
WORK PLAN FEB. 1993

TABLE 2. MAXIMUM CONTAMINANT CONCENTRATION OF SEEP (SURFACE) WATER (1,2)
Wheeling Disposal Service Company, Inc. Site
All levels in ppb (1,2)

Contaminant	Maximum Concentration (ppb)		Comparison Value ppb	Source
ORGANICS				
1,2-Dichloroethene (total)	201		7	MCL
Chloroform*	380		100	MCL
1,2-Dichloroethane*	23,000		5	MCL
Bis(2-Ethylhexyl)Phthalate*	37		3	CREG
Carbon Tetrachloride*	3,600		5	MCL
Trichloroethylene (TCE)*	15,000		5	MCL
Ethylene Dibromide*	150		0.0004	CREG
Atrazine	7		3	MCL
Methylene Chloride*	510		5	MCL
INORGANICS	Unfiltered	Filtered		
Barium	400	142	2000	MCL
Manganese	1,100	522	50	RMEG
Arsenic*	26	ND	50	MCL
Aluminum	4,400	1,000	50	PSMCL
Iron	40,900	3,120	300	SMCL
Sodium	61,100	52,800	--	--
Lead*	25	11	--	--

* = possible carcinogen
-- = Not Available
MCL = Maximum Contaminant Level
SMCL = Secondary Maximum Contaminant Level
CREG = Cancer Risk Evaluation Guide
RMEG = Reference Dose Media Evaluation Guide
PSMCL = Proposed Secondary Maximum Contaminant Level

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